

Session 1.6

Case Studies - Lessons Learned in Other Disciplines

Day 1

Paper 162
Internet – Lessons Learned
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The Internet - Lessons learned

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Purpose of the Presentation

To answer the question: Can lessons be learned from the history, culture, philosophy and architecture of the Internet by the ITS community?

This presentation is not intended as a description of the manner in which the internet can be used to support ITS

Presentation Agenda

- Some Internet background
- Contrasting the Internet with ongoing ITS activities
- Concerns regarding current directions in ITS
- Conclusions

The Internet Timeline

- '57 - USSR launches Sputnik
- '65 - ARPAsponsors study on cooperative network of time-sharing computers
- 69 -ARPA funded, fledgling four node network operational. (UCLA BBN)
- '76 -ALOHA net connected to the ARPANET. (U of Hawaii]

Internet Timeline (continued)

- 71 -ARPANET expands to 15 nodes and 23 hosts. BBN invents email.
- '72 - InterNetworking Working Group [INWG] created to work on protocols
- '74 BBN introduces Telenet, the first public packet data service
- '79 -ARPA Establishes the Internet Configuration Control Board UCCBI

Internet Timeline (continued)

- '88 - DoD chooses GOSIP and sees the use of TCP/IP as an interim step
- '90 - ARPANET ceases to exist
- '90 - ISODE developed to allow DoD to operate over TCP/IP network
- '91 - World-Wide Web (WWW) released

And the Rest is History

- Networks proliferated

ALOHAnet	ARPANET	Telenet
THEORYNET	USENET	PRNET
CSNET	EUNET	MILNET
EARN	JUNET	JANET
NSFNET	NPTN	BARRNET
UUNET	FidoNet	etc. etc. etc.

Some Standards Were Developed to Support the Technology

- '72 - Telnet spec.
- '73 - File Transfer spec.
- '77 - Mail spec.
- '82 TCP/IP selected for ARPANET

Observations on the Success of the Internet

- Standards focus on interoperability
- Accommodates the changes of the past 20 years:
 - at least four generations of systems technology
 - unimaginable changes in software capabilities
- Initial phases succeeded with minimal standards

Observations - continued

- Voluntary participation by governments and industry
- Emphasizes pull type information transfer as opposed to push
- Does not define h/w, s/w, operating system, architecture, or functionality of hosts
- Offers the power of hypertext

ITS and the Internet - Similarities

- ITS is at the point that the Internet was, in the early 1970's (when ARPA was letting go)
- High degree of s/w and h/w independence
- Emerging standards emphasize interoperability

ITS and the Internet - Differences

- The ITS approach reflects a higher degree of centralized management (Government led)
- In ITS, functions have been specified first, interoperability is second
- ITS emphasizes a push type of data transfer
- Centralized ITS architectures are implied

The Danger of Specifying Functions

1.1.2.1 - Process Traffic Data for Storage

The data stored ... in the current data store shall show the values collected over the last five minute period... and shall be updated every five minutes. The data in the long term data store shall show the data collected over the last hour, and for each hour that has passed in the current day ... in a rolling two week period.

Potential Problems with this Spec

- For traffic control, short term data is often needed at one minute intervals
- For long term data store, data is typically stored at 15 minute intervals
- Variable length intervals are preferable for long term store
- Two weeks are not enough to evaluate seasonal trends and to accumulate history
- "Representative day-type" data not mentioned

Implied Centralization

- All major functions (parking, commercial vehicle, etc.) are called subsystems
- The term distributed refers only to field equipment
- Distributed road management refers to data exchange between centers "that are either adjacent geographically or under the control of a different jurisdiction".

Conclusions

- ITS architecture and standards should emphasize interoperability
- Functional standardization, and centralization should be de-emphasized
- Internet standards and products should be used to the maximum extent (TCP/IP, HTML, search engines, etc.)
- Research to support this approach would be useful